Common Market for Eastern and Southern Africa

EDICT OF GOVERNMENT

COMESA 225-5 (2006) (English): Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords)

BLANK PAGE

COMESA HARMONISED STANDARD

COMESA/DHS 225-5: 2005

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 5: Flexible cables (cords)

REFERENCE: DHS 225-5: 2005

Foreword

The Common Market for Eastern and Southern Africa (COMESA) was established in 1994 as a regional economic grouping consisting of 20 member states after signing the co-operation Treaty. In Chapter 15 of the COMESA Treaty, Member States agreed to co-operate on matters of standardisation and Quality assurance with the aim of facilitating the faster movement of goods and services within the region so as to enhance expansion of intra-COMESA trade and industrial expansion.

Co-operation in standardisation is expected to result into having uniformly harmonised standards. Harmonisation of standards within the region is expected to reduce Technical Barriers to Trade that are normally encountered when goods and services are exchanged between COMESA Member States due to differences in technical requirements. Harmonized COMESA Standards are also expected to result into benefits such as greater industrial productivity and competitiveness, increased agricultural production and food security, a more rational exploitation of natural resources among others.

COMESA Standards are developed by the COMESA experts on standards representing the National Standards Bodies and other stakeholders within the region in accordance with international procedures and practices. Standards are approved by circulating Final Draft Harmonized Standards (FDHS) to all member states for a one Month vote. The assumption is that all contentious issues would have been resolved during the previous stages or that an international or regional standard being adopted has been subjected through a development process consistent with accepted international practice.

COMESA Standards are subject to review, to keep pace with technological advances. Users of the COMESA Harmonized Standards are therefore expected to ensure that they always have the latest version of the standards they are implementing.

This COMESA standard is technically identical to the International Standard *IEC 60227-5:2003.*

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
60227-5

Edition 2.2

2003-07

Edition 2:1997 consolidée par les amendements 1:1997 et 2:2003
Edition 2:1997 consolidated with amendments 1:1997 and 2:2003

Conducteurs et câbles isolés au polychlorure de vinyle, de tension assignée au plus égale à 450/750 V –

Partie 5: Câbles souples

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V –

Part 5: Flexible cables (cords)

Numéro de référence
Reference number
CEI/IEC 60227-5:1997+A1:1997+A2:2003

CONTENTS

POLYVINYL CHLORIDE INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V –

Part 5: Flexible cables (cords)

1 General

1.1 Scope

This part of IEC 60227 details the particular specifications for polyvinyl chloride insulated flexible cables (cords), of rated voltages up to and including 300/500 V.

All cables comply with the appropriate requirements given in IEC 60227-1 and each individual type of cable complies with the particular requirements of this part.

1.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60227-1:1993, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 1: General requirements*

IEC 60227-2:1979, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 2: Test methods*

IEC 60228:1978, *Conductors of insulated cables. Guide to the dimensional limits of circular conductors*

IEC 60332-1:1993 *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general applications – Section 1: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-1-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general applications – Section 2: Thermal ageing methods*

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general applications – Section 4: Tests at low temperature*

IEC 60811-3-1:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section 1: Pressure test at high temperature – Tests for resistance to cracking*

IEC 60811-3-2:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 3: Methods specific to PVC compounds – Section 2: Loss of mass test – Thermal stability test*

2 Flat tinsel cord

2.1 Code designation

60227 IEC 41.

2.2 Rated voltage

300/300 V.

2.3 Construction

2.3.1 Conductor

Number of conductors: 2.

Each conductor shall comprise a number of strands or groups of strands, twisted together, each strand being composed of one or more flattened wires of copper or copper alloy, helically wound on a thread of cotton, polyamide or similar material.

The conductor resistance shall not exceed the value given in table 1, column 5.

2.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/D applied around each conductor.

The insulation thickness shall comply with the specified value given in table 1, column 1.

The insulation resistance shall be not less than the value given in table 1, column 4.

2.3.3 Assembly of cores

The conductors shall be laid parallel and covered with the insulation.

The insulation shall be provided with a groove on both sides, between the conductors, to facilitate separation of the cores.

2.3.4 Overall dimensions

The mean overall dimensions shall be within the limits given in table 1, columns 2 and 3.

2.4 Tests

Compliance with the requirements of 2.3 shall be checked by inspection and by the tests given in table 2.

2.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE Other guidelines are under consideration.

Table 1 – General data for type 60227 IEC 41

1	2	3	4	5
Insulation thickness	**Mean overall dimensions**		**Minimum insulation resistance at 70 °C**	**Maximum conductor resistance at 20 °C**
Specified value mm	**Lower limits** mm	**Upper limits** mm	MΩ·km	Ω/km
0,8	2,2 × 4,4	3,5 × 7,0	0,019	270
NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.				

Table 2 – Tests for type 60227 IEC 41

1	2	3	4	
Ref. No.	**Test**	**Category of test**	**Test method described in:**	
			IEC Standard	**Subclause**
1	*Electrical tests*			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.2
1.3	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	*Provisions covering constructional and dimensional characteristics*		IEC 60227-1 IEC 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1	Inspection and manual test
2.2	Measurement of insulation thickness	T, S	IEC 60227-2	1.9
2.3	Measurement of overall dimensions	T, S	IEC 60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before and after ageing	T	IEC 60811-1-1	9.1
			IEC 60811-1-2	8.1
3.2	Loss of mass test	T	IEC 60811-3-2	8.1
4	*Pressure test at high temperature*	T	IEC 60811-3-1	8.1
5	*Elasticity at low temperature*			
5.1	Bending test for insulation at low temperature	T	IEC 60811-1-4	8.1
6	*Heat shock test*	T	IEC 60811-3-1	9.1
7	*Mechanical strength of completed cable*			
7.1	Bending test	T	IEC 60227-2	3.2
7.2	Snatch test	T	IEC 60227-2	3.3
8	*Test of flame retardance*	T	IEC 60332-1	

3 Not used

4 Cord for indoor decorative lighting chains

4.1 Code designation

60227 IEC 43.

4.2 Rated voltage

300/300 V.

4.3 Construction

4.3.1 Conductor

Number of conductors: 1.

The conductor shall comply with the requirements given in IEC 60228 for class 5 conductors.

4.3.2 Insulation

The insulation shall be polyvinyl chloride of the type PVC/D, it shall consist of two layers and applied by dual extrusion around the conductor.

The outer layer of insulation shall be of a colour contrasting with that of the inner layer, but shall adhere to the inner layer.

The combined thickness of the inner and outer layer of insulation shall comply with the overall thickness specified in table 5, columns 3 and 4, but at no point the thickness of either layer shall be less than the value specified in column 2.

The insulation resistance at 70 °C shall be not less than the values given in table 5, column 7.

4.3.3 Cord identification

Preferred colour of outer layer: green.

4.3.4 Overall diameter

The mean overall diameter shall be within the limits given in table 5, columns 5 and 6.

4.4 Tests

Compliance with the requirements of 4.3 shall be checked by inspection and by the tests given in table 6.

4.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

Table 5 – General data for type 60227 IEC 43

1	2	3	4	5	6	7
Nominal cross-sectional area of conductor	**Thickness of each layer of insulation**	**Overall insulation thickness**	**Overall insulation thickness**	**Mean overall diameter**		**Minimum insulation resistance at 70 °C**
	Mininum value	**Minimum value**	**Mean value**	**Lower limit**	**Upper limit**	
mm^2	mm	mm	mm	mm	mm	MΩ·km
0,5	0,2	0,6	0,7	2,3	2,7	0,014
0,75	0,2	0,6	0,7	2,4	2,9	0,012
NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.						

Table 6 – Tests for type 60227 IEC 43

1	2	3	4	
Ref. No.	**Tests**	**Category of test**	**Test method described in:**	
			IEC Standard	**Subclause**
1	*Electrical tests*			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.3
1.3	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	*Constructional/dimensional characteristics*		IEC 60227-1 IEC 60227-2	
2.1	Compliance with constructional provisions	T, S	IEC 60227-1	Inspection and manual tests
			IEC 60227-5	4.3
2.2	Measurement of insulation thickness of inner layer (minimum thickness only)	T, S	IEC 60227-2	1.9
2.3	Measurement of insulation thickness of outer layer (minimum thickness only)	T, S	IEC 60227-2	1.9
2.4	Measurement of overall thickness (note)	T, S	IEC 60227-2	1.9
2.5	Measurement of overall diameter	T, S	IEC 60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before ageing (note)	T	IEC 60811-1-1	9.1
3.2	Tensile test after ageing (note)	T	IEC 60811-1-2	8.1.3.1
3.3	Loss of mass test (note)	T	IEC 60811-3-2	8.1
4	*Pressure test at high temperature* (note)	T	IEC 60811-3-1	8
5	*Elasticity at low temperature*			
5.1	Bend test for insulation (note)	T	IEC 60811-1-4	8.1
6	*Heat shock test* (note)	T	IEC 60811-3-1	9.1
7	*Test of flame retardance*	T	IEC 60332-1	–
NOTE Because of the simultaneous extrusion of the same compound for both layers of insulation, the composite layer shall be tested as one layer and evaluated accordingly.				

5 Light polyvinyl chloride sheathed cord

5.1 Code designation

60227 IEC 52.

5.2 Rated voltage

300/300 V.

5.3 Construction

5.3.1 Conductor

Number of conductors: 2 and 3.

The conductors shall comply with the requirement given in IEC 60228 for class 5.

5.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/D applied around each conductor.

The insulation thickness shall comply with the specified value given in table 7, column 2.

The insulation resistance shall be not less than the values given in table 7, column 6.

5.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

5.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST 5 applied around the cores.

The sheath thickness shall comply with the specified value given in table 7, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cord shall have a practically circular cross-section.

5.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 7, columns 4 and 5.

5.4 Tests

Compliance with the requirements of 5.3 shall be checked by inspection and by the tests given in table 8.

5.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE Other guidelines are under consideration.

Table 7 – General data for type 60227 IEC 52

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors	**Thickness of insulation**	**Thickness of sheath**	**Mean overall dimensions**		**Minimum insulation resistance at 70 °C**
	Specified value	**Specified value**	**Lower limit**	**Upper limit**	
mm^2	mm	mm	mm	mm	
2 × 0,5	0,5	0,6	4,6 or 3,0 × 4,9	5,9 or 3,7 × 5,9	0,012
2 × 0,75	0,5	0,6	4,9 or 3,2 × 5,2	6,3 or 3,8 × 6,3	0,010
3 × 0,5	0,5	0,6	4,9	6,3	0,012
3 × 0,75	0,5	0,6	5,2	6,7	0,010
NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.					

Table 8 – Tests for type 60227 IEC 52

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Standard	Subclause
1	*Electrical tests*			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test oncores at 1 500 V	T, S	IEC 60227-2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	IEC 60227-2	2.2
1.4	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	*Provisions covering constructional and dimensionsl characteristics*		IEC 60227-1 IEC 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1	Inspection and manual tests
2.2	Measurement of insulation thickness	T, S	IEC 60227-2	1.9
2.3	Measurement of sheath thickness	T, S	IEC 60227-2	1.10
2.4	Measurement of overall dimensions:			
2.4.1	mean value	T, S	IEC 60227-2	1.11
2.4.2	ovality	T, S	IEC 60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before and after ageing	T	IEC 60811-1-1 IEC 60811-1-2	9.1 8.1
3.2	Loss of mass test	T	IEC 60811-3-2	8.1
4	*Mechanical properties of sheath*			
4.1	Tensile test before and after ageing	T	IEC 60811-1-1 IEC 60811-1-2	9.2 8.1
4.2	Loss of mass test	T	IEC 60811-3-2	8.2
5	*Pressure test at high temperature*			
5.1	Insulation	T	IEC 60811-3-1	8.1
5.2	Sheath	T	IEC 60811-3-1	8.2
6	*Elasticity and impact strength at low temperature*			
6.1	Bending test for insulation at low temperature	T	IEC 60811-1-4	8.1
6.2	Bending test for sheath at low temperature	T	IEC 60811-1-4	8.2
6.3	Impact test on completed cable at low temperature	T	IEC 60811-1-4	8.5
7	*Heat shock test*			
7.1	Insulation	T	IEC 60811-3-1	9.1
7.2	Sheath	T	IEC 60811-3-1	9.2
8	*Mechanical strength of completed cable*			
8.1	Flexing test	T	IEC 60227-2	3.1
9	*Test of flame retardance*	T	IEC 60332-1	

6 Ordinary polyvinyl chloride sheathed cord

6.1 Code designation

60227 IEC 53.

6.2 Rated voltage

300/500 V.

6.3 Construction

6.3.1 Conductor

Number of conductors: 2, 3, 4 or 5.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors.

6.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/D applied around each conductor.

The insulation thickness shall comply with the specified value given in table 9, column 2.

The insulation resistance shall be not less than the value given in table 9, column 6.

6.3.3 Assembly of cores and fillers, if any

Circular cord: the cores and the fillers, shall be twisted together.

Flat cord: the cores shall be laid parallel.

For circular cord having two cores, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

Any filler shall not adhere to the cores.

6.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST 5 applied around the cores.

The sheath thickness shall comply with the specified value given in table 9, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cords shall have a practically circular cross-section.

6.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 9, columns 4 and 5.

Table 9 – General data for type 60227 IEC 53

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors	**Thickness of insulation**	**Thickness of sheath**	**Mean overall dimensions**		**Minimum insulation resistance at 70 °C**
mm²	**Specified value** mm	**Specified value** mm	**Lower limit** mm	**Upper limit** mm	MΩ·km
2 x 0,75	0,6	0,8	5,7 or 3,7 x 6,0	7,2 or 4,5 x 7,2	0,011
2 x 1	0,6	0,8	5,9 or 3,9 × 6,2	7,5 or 4,7 × 7,5	0,010
2 x 1,5	0,7	0,8	6,8	8,6	0,010
2 x 2,5	0,8	1,0	8,4	10,6	0,009
3 x 0,75	0,6	0,8	6,0	7,6	0,011
3 x 1	0,6	0,8	6,3	8,0	0,010
3 x 1,5	0,7	0,9	7,4	9,4	0,010
3 x 2,5	0,8	1,1	9,2	11,4	0,009
4 x 0,75	0,6	0,8	6,6	8,3	0,011
4 x 1	0,6	0,9	7,1	9,0	0,010
4 x 1,5	0,7	1,0	8,4	10,5	0,010
4 x 2,5	0,8	1,1	10,1	12,5	0,009
5 x 0,75	0,6	0,9	7,4	9,3	0,011
5 x 1	0,6	0,9	7,8	9,8	0,010
5 x 1,5	0,7	1,1	9,3	11,6	0,010
5 x 2,5	0,8	1,2	11,2	13,9	0,009

NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.

6.4 Tests

Compliance with the requirements of 6.3 shall be checked by inspection and by the tests given in table 10.

6.5 Guide to use

Maximum conductor temperature in normal use: 70 °C.

NOTE Other guidelines are under consideration.

Table 10 – Tests for type 60227 IEC 53

1	2	3	4	
Ref. No.	Test	Category of test	Test method described in:	
			IEC Standard	Subclause
1	*Electrical tests*			
1.1	Resistance of conductors	T, S	IEC 60227-2	2.1
1.2	Voltage test on cores according to specified insulation thickness:	T, S	IEC 60227-2	2.3
1.2.1	at 1 500 V up to and including 0,6 mm	T	IEC 60227-2	2.3
1.2.2	at 2 000 V exceeding 0,6 m	T	IEC 60227-2	2.3
1.3	Voltage test on complete cable at 2 000 V	T	IEC 60227-2	2.2
1.4	Insulation resistance at 70 °C	T	IEC 60227-2	2.4
2	*Provisions covering constructional and dimensional characteristics*		IEC 60227-1 IEC 60227-2	
2.1	Checking of compliance with constructional provisions	T, S	IEC 60227-1 IEC 60227-2	Inspection and manual tests
2.2	Measurement of insulation thickness	T, S	IEC 60227-2	1.9
2.3	Measurement of overall dimensions	T, S	IEC 60227-2	1.10
2.4	Measurement of overall dimensions:			
2.4.1	mean value	T, S	IEC 60227-2	1.11
2.4.2	ovality	T, S	IEC 60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before and after ageing	T	IEC 60811-1-1 IEC 60811-1-2	9.1 8.1
3.2	Loss of mass test	T	IEC 60811-3-2	8.1
4	*Mechanical properties of sheath*			
4.1	Tensile test before and after ageing	T	IEC 60811-1-1 IEC 60811-1-2	9.2 8.1
4.2	Loss of mass test	T	IEC 60811-3-2	8.2
5	*Test of non-contamination*	T	IEC 60811-1-2	8.1.4
6	*Pressure test at high temperature*			
6.1	Insulation	T	IEC 60811-3-1	8.1
6.2	Sheath	T	IEC 60811-3-1	8.2
7	*Elasticity and impact strength at low temperature*			
7.1	Bending test for insulation at low temperature	T	IEC 60811-1-4	8.1
7.2	Bending test for sheath at low temperature	T	IEC 60811-1-4	8.2
7.3	Impact test on completed cable at low temperature	T	IEC 60811-1-4	8.5
8	*Heat shock test*			
8.1	Insulation	T	IEC 60811-3-1	9.1
8.2	Sheath	T	IEC 60811-3-1	9.2
9	*Mechanical strength of completed cable*			
9.1	Flexing test	T	IEC 60227-2	3.1
10	*Test of flame retardance*	T	IEC 60332-1	

7 Heat-resistant light PVC-sheathed cord for a maximum conductor temperature of 90 °C

7.1 Code designation

60227 IEC 56

7.2 Rated voltage

300/300 V

7.3 Construction

7.3.1 Conductor

Number of conductors: 2 and 3.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors.

7.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/E applied around each conductor.

The insulation thickness shall comply with the specified value given in table 11, column 2.

The insulation resistance shall be not less than the values given in table 11, column 6.

7.3.3 Assembly of cores

Circular cord: the cores shall be twisted together.

Flat cord: the cores shall be laid parallel.

7.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10, applied around the cores.

The sheath thickness shall comply with the specified value given in table 11, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores. The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cord shall have a practically circular cross-section.

7.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 11, columns 4 and 5.

7.4 Tests

Compliance with the requirements of 7.3 shall be checked by inspection and by the tests given in table 12.

7.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE Other guidelines are under consideration.

Table 11 – General data for type 60227 IEC 56

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors	**Insulation thickness**	**Sheath thickness**	**Mean overall dimensions**		**Minimum insulation resistance at 90 °C**
	Specified value	**Specified value**	**Lower limits**	**Upper limits**	
mm^2	mm	mm	mm	mm	MΩ·km
2 × 0,5	0,5	0,6	4,6 or 3,0 × 4,9	5,9 or 3,7 × 5,9	0,012
2 × 0,75	0,5	0,6	4,9 or 3,2 × 5,2	6,3 or 3,8 × 6,3	0,010
3 × 0,5	0,5	0,6	4,9	6,3	0,012
3 × 0,75	0,5	0,6	5,2	6,7	0,010

NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.

Table 12 – Tests for type 60227 IEC 56

1	2	3	4	5
			Test methods described in:	
Reference No.	Test	Category of test	IEC standard	clause/ subclause
1	*Electrical tests*			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores at 1 500 V	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	*Provisions covering constructional and dimensional characteristics*			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
4	*Mechanical properties of sheath*			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	*Pressure test at high temperature*			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	*Tests at low temperature*			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath	T	60811-1-4	8.2
6.3	Impact test	T	60811-1-4	8.5
7	*Heat shock test*			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	*Thermal stability*			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	*Mechanical strength of complete cable*			
9.1	Flexing test	T	60227-2	3.1
10	*Test of flame retardance*	T	60332-1	–

8 Heat-resistant ordinary PVC-sheathed cord for a maximum conductor temperature of 90 °C

8.1 Code designation

60227 IEC 57

8.2 Rated voltage

300/500 V

8.3 Construction

8.3.1 Conductor

Number of conductors: 2, 3, 4 or 5.

The conductors shall comply with the requirements given in IEC 60228 for class 5 conductors.

8.3.2 Insulation

The insulation shall be polyvinyl chloride compound of type PVC/E applied around each conductor.

The insulation thickness shall comply with the specified value given in table 13, column 2.

The insulation resistance shall be not less than the value given in table 13, column 6.

8.3.3 Assembly of cores and fillers, if any

Circular cord: the cores and the fillers, if any, shall be twisted together.

Flat cord: the cores shall be laid parallel.

For circular cord having two cores, the space between the cores shall be filled either by separate fillers or by the sheath filling the interstices.

Any filler shall not adhere to the cores.

8.3.4 Sheath

The sheath shall be polyvinyl chloride compound of type PVC/ST10 applied around the cores.

The sheath thickness shall comply with the specified value given in table 13, column 3.

The sheath may fill the spaces between the cores, thus forming a filling, but it shall not adhere to the cores.

The assembly of cores may be surrounded by a separator, which shall not adhere to the cores.

The assembly of circular cords shall have a practically circular cross-section.

8.3.5 Overall dimensions

The mean overall diameter of circular cords and the mean overall dimensions of flat cords shall be within the limits given in table 13, columns 4 and 5.

Table 13 – General data for type 60227 IEC 57

1	2	3	4	5	6
Number and nominal cross-sectional area of conductors	**Insulation thickness**	**Sheath thickness**	**Mean overall dimensions**		**Minimum insulation**
	Specified value	**Specified value**	**Lower limit**	**Upper limit**	**resistance at 90 °C**
mm^2	mm	mm	mm	mm	MΩ·km
2 × 0,75	0,6	0,8	5,7 or 3,7 × 6,0	7,2 or 4,5 × 7,2	0,011
2 × 1	0,6	0,8	5,9 or 3,9 × 6,2	7,5 or 4,7 × 7,5	0,010
2 × 1,5	0,7	0,8	6,8	8,6	0,010
2 × 2,5	0,8	1,0	8,4	10,6	0,009
3 × 0,75	0,6	0,8	6,0	7,6	0,011
3 × 1	0,6	0,8	6,3	8,0	0,010
3 × 1,5	0,7	0,9	7,4	9,4	0,010
3 × 2,5	0,8	1,1	9,2	11,4	0,009
4 × 0,75	0,6	0,8	6,6	8,3	0,011
4 × 1	0,6	0,9	7,1	9,0	0,010
4 × 1,5	0,7	1,0	8,4	10,5	0,010
4 × 2,5	0,8	1,1	10,1	12,5	0,009
5 × 0,75	0,6	0,9	7,4	9,3	0,011
5 × 1	0,6	0,9	7,8	9,8	0,010
5 × 1,5	0,7	1,1	9,3	11,6	0,010
5 × 2,5	0,8	1,2	11,2	13,9	0,009

NOTE The mean overall dimensions have been calculated in accordance with IEC 60719.

8.4 Tests

Compliance with the requirements of 8.3 shall be checked by inspection and by the tests given in table 14.

8.5 Guide to use

Maximum conductor temperature in normal use: 90 °C.

NOTE Other guidelines are under consideration.

Table 14 – Tests for type 60227 IEC 57

1	2	3	4	5
Reference No.	**Tests**	**Category of test**	**Test methods described in:**	
			IEC standard	**clause/ subclause**
1	*Electrical tests*			
1.1	Resistance of conductors	T,S	60227-2	2.1
1.2	Voltage test on completed cable at 2 000 V	T,S	60227-2	2.2
1.3	Voltage test on cores according to specified insulation thickness:			
1.3.1	– at 1 500 V up to and including 0,6 mm	T	60227-2	2.3
1.3.2	– at 2 000 V exceeding 0,6 mm	T	60227-2	2.3
1.4	Insulation resistance at 90 °C	T	60227-2	2.4
2	*Provisions covering constructional and dimensional characteristics*			
2.1	Checking of compliance with constructional provisions	T,S	60227-1	Inspection and manual tests
2.2	Measurement of thickness of insulation	T,S	60227-2	1.9
2.3	Measurement of thickness of sheath	T,S	60227-2	1.10
2.4	Measurement of overall dimensions			
2.4.1	Mean value	T,S	60227-2	1.11
2.4.2	Ovality	T,S	60227-2	1.11
3	*Mechanical properties of insulation*			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
3.3	Loss of mass test	T	60811-3-2	8.1
3.4	Compatibility test [1)]	T	60811-1-2	8.1.4
4	*Mechanical properties of sheath*			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing	T	60811-1-2	8.1.3.1
4.3	Loss of mass test	T	60811-3-2	8.2
5	*Pressure test at high temperature*			
5.1	Insulation	T	60811-3-1	8.1
5.2	Sheath	T	60811-3-1	8.2
6	*Tests at low temperature*			
6.1	Bending test for insulation	T	60811-1-4	8.1
6.2	Bending test for sheath [2)]	T	60811-1-4	8.2
6.3	Elongation test for sheath [3)]	T	60811-1-4	8.4
6.4	Impact test	T	60811-1-4	8.5
7	*Heat shock test*			
7.1	Insulation	T	60811-3-1	9.1
7.2	Sheath	T	60811-3-1	9.2
8	*Thermal stability*			
8.1	Insulation	T	60811-3-2	9
8.2	Sheath	T	60811-3-2	9
9	*Mechanical strength of complete cable*			
9.1	Flexing test	T	60227-2	3.1
10	*Test of flame retardance*	T	60332-1	–

1) See 5.3.1 of IEC 60227-1.

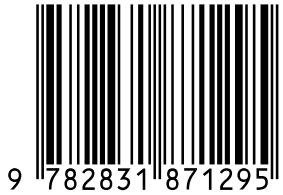
2) Only applicable to cables having mean overall diameters up to and including 12,5 mm.

3) Only applicable if the mean overall diameter of the cable exceeds 12,5 mm.

Bibliography

IEC 60719:1992, *Calculation of the lower and upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750 V*

ISBN 2-8318-7129-8



ICS 29.060.20

Typeset and printed by the IEC Central Office
GENEVA, SWITZERLAND